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## Process and Device for the Coating of Bodies with Fiber-Reinforced Duroplastics

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The invention concerns a process and a device for the coating of bodies like, e.g., floating and flying bodies, pane elements, bulk storage tanks and the like, with fiber-reinforced duroplastics.

Until now only the manual application technique is known for the production or the coating of such bodies - in spite of various attempts. This is true in particular for bodies with irregularly curved enveloping surfaces. Known automated winding processes can be used only for rotationally symmetrical bodies; the also known fiber spray [molding] process may be used only to a limited extent because only relatively low strength values are thereby obtained as a consequence of the absence of a continuous fibrous web.

It is the object of the invention to avoid the disadvantages of the known [process], thus create in particular a process and a device for the automated and possibly semi-automated coating of bodies.

The means according to the invention for attaining this object are first and foremost in that a web impregnated with a thickened resin is continuously and under pressure calendar-coated onto the body and simultaneously heated.

Through the continuous application and immediate curing of the web one makes possible in an optimally simple way an uninterrupted coating of bodies, which [coating] is characterized through the high strength values known for manual application processes.

The impregnation of the web with thickened resin, which usually already comprises the curing component and which can be adjusted in its formulation such that shortest [possible] reaction times are obtained under pressure and heat, thereby allows for relatively high working speeds and thereto connected economic serial production.

The invention may be advantageously achieved with a device which has a calender-coating head with at least one pressure roller that can be moved in relation to the body and pressed against it, as well as a heating device over which may be pulled the resin web held on a supply roll.

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The combination of the pressure roller, the heating device and the supply roll within one structural unit thereby guarantees [a] simple handling. Through the immediate curing of the resin during the coating, one can on one hand use the device according to the invention in any arbitrary relative position and on the other hand, the quality of the laminate is independent of fluctuations in the ambient temperature, or very generally, the production of duroplastics laminates is made possible, independent of the ambient temperature.

In a further design, the device according to the invention can be improved in that the pressure roller is driven by a drive unit and a constant rate of advance of the coating process is thus guaranteed automatically.

Also advantageous is if following the pressure roller there is a plate-shaped, elastic heating device [which] presses the resin web against the body, which ensures a flat close-fitting during the heating and the curing of the resin web against the body.

According to the invention it is provided, in particular in view of a quick heating and increased rate of operation, for the pressure roller itself to be heated as well as to connect downstream a separate heating device.

In order to adjust the rate of advance of the calender-coating head to the various operational parameters, a control device for the drive of the pressure roller is provided in addition to a controller of the heating device. [A] particularly simple handling of the calender-coating head is ensured if it is connected via a Cardan joint to a holding unit adjustable in [its] height, and if via a cantilever arm, the holding unit is fastened to a holding device above the body to be coated, shiftable longitudinally; a possibly necessary lateral sweep may thereby be achieved if the cantilever arm is attached to the holding device [so as to be] vertically swiveling around its point of fastening.

The content of the invention and the technical progress of the subject matter of the application is obviously justified in the new individual characteristics as well as also in particular in the combination and sub-combination of all disclosed characteristics.

In an example of embodiment, the invention is explained more closely by means of the drawings.

[The figures] show:

Fig. 1 a schematic representation of the calender-coating head with the characteristics of the invention,

Fig. 2 the representation of the laminate coating of a ship's hull and

Fig. 3 the top view onto a device for the interior coating of a container.

The calender-coating head 1 has according to Fig. 1 and supply roll 2 for [the]<sup>1</sup> resin web 3, which runs over [the] pressure roller 4, heating device 5 and pressure roller 6 and is applied onto [the] body 7. [The] heating device 5 is thereby pressed by the spring 8 against the resin web 3 such that a good transfer of heat is ensured on one hand and on the other hand one achieves an additional smoothing of the resin web 3. [The] pressure roller 4 is driven by [the] drive unit 10 via [a] chain drive 9 at a constant rate, so that a uniform quality is achieved of the laminate coat.

Fig. 2 shows [the] calender-coating head 1 during the coating of a ship's hull 11 at a reduced scale. The calender-coating head 1 is thereby fastened via a Cardan joint 12 to [the] holding device 13, which is mounted vertically adjustable, to the uncoiled<sup>2</sup> cantilever arm 14. The calender-coating head 1 is hinged by means of a hinged joint 15 to a trolley designed as central holding device 16, which may be shifted along a flying bridge 17. During operation, the calender-coating head 1 is pushed by its own weight, around [the] hinged joint 15, constantly against the ship's hull 11. Through the adjustability in height of the holder 13 and the axial shiftability of the trolley 16 it is possible to reach without difficulty all sections of the ship's hull 11.

According to Fig. 3, the calender-coating head is fastened to [the] calender-coating head 1 and during the coating process of [the] wall 19 of a cylindrical bulk storage tank runs around [the] pivot 18. The initial elastic tension of the calender-coating head 1 against [the] wall 19 is achieved via adjustable spring elements [that are] not represented. Based on the rotationally symmetric shape of the container it is possible to drive the calender-coating head 1 at constant speed with simultaneous adjusting in height in order to achieve a helical coating.

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<sup>1</sup> the majority of the articles in this portion have been omitted, leaving the sentences to seem incomplete.

<sup>2</sup> possibly a typographic error: *abgewickelt* = uncoiled; *abgewinkelt* = angular, bent was probably intended

The individual laps laterally overlap slightly. The formation of a plurality of layers on top of one another until achieving the desired strength values is possible without difficulty.

### Patent Claims

1. Process for the laminate-coating of a body, characterized in that a web impregnated with a thickened resin is continuously and under pressure calendar-coated onto the body and simultaneously heated.
2. Device for performing the process according to the invention, characterized in that it has a calender-coating head with at least one pressure roller that can be moved in relation to the body and pressed against it, as well as a heating device over which may be pulled the resin web held on a supply roll.
3. Device according to claim 2, characterized in that the heating device is provided for heating the pressure roller.
4. Device according to claim 2, characterized in that the heating device follows the pressure roller in the feeding direction of the resinous web.
5. Device according to claim 4, characterized in that the heating device is simultaneously provided for the heating of the pressure roller.
6. Device according to one of the claims 4 or 5, characterized in that a second pressure roller is following the heating device.
7. Device according to one of the previous claims, characterized in that the heating device has a heating plate pushing the resinous web elastically against the body.
8. Device according to one of the previous claims, characterized in that at least one of the pressure rollers has a driving unit.
9. Device according to claim 8, characterized in that the driving unit has a continuously adjustable control unit.
10. Device according to one of the previous claims, characterized in that the calender-coating head is hinged cardanically to a holding unit adjustable in its height.

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11. Device according to claim 10 characterized in that the holding device is mounted to a cantilever arm, [capable of being] shifted axially.
12. Device according to claim 11, characterized in that the cantilever arm is attached to a holding device, longitudinally movable over the body to be coated.
13. Device according to claim 11, characterized in that the cantilever arm is attached to the holding device [so as to be] vertically swiveling around its point of fastening.